Prevalence of asthma and asthma-like symptoms in Dalat Highlands, Vietnam

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ABSTRACT

Introduction: No data has been reported on the prevalence of asthma in highland rural areas of Vietnam. We attempt to determine the prevalence of asthma and asthma-like symptoms in Dalat, a Vietnamese city at 1,500 m altitude, and to learn about environmental influences, patient attitudes toward diagnosis and treatment, and the prevalent general knowledge about asthma.

Methods: Investigators were trained in the use of formal questionnaires. After an extensive publicity campaign by local television, the investigators randomly selected homes for interviews in 12 districts. When physician-diagnosed asthma or asthma-like symptoms were identified, all parts of the questionnaire were completed and a more detailed visit was arranged with the patients, for clinical examination, spirometry and skin tests for important allergens.

Results: 9,984 individuals were interviewed, of whom 243 were identified as having asthma or asthma-like symptoms, giving a prevalence of 2.4 percent. Average age was 48 +/- 27 years, age at onset of asthma was 25 +/- 22 years. Hospitalisation had been required in 18.3 percent of patients during 2003. Daily asthma treatment was used by only 17 percent of patients. 34 percent used inhalers and 6 percent used nebulisation. 52.3 percent had associated atopic features. Polyvalent positive prick tests were prevalent, but no one reacted to a pollen mixture. General knowledge about asthma was lacking.

Conclusion: The prevalence of asthma and asthma-like symptoms in Dalat is low. Allergic cutaneous reactions to house mites predominate. Diagnosis and treatment of those afflicted with asthma appears to be suboptimal. The study highlights the need for further patient education and for preventative interventions for asthma sufferers in this region.

Keywords: allergies, asthma, asthma-like symptoms

Singapore Med J 2007; 48(4):294–303

INTRODUCTION

Until the middle of the 1990s, the prevalence of asthma and allergic diseases was practically unknown in developing countries. Since then, progress has been made using standardised questionnaires,[1] and some Asian-Pacific countries have participated in the International Study of Asthma and Allergies in Childhood study (ISAAC).[2] Countries at greatest disadvantage, such as Vietnam, Cambodia and Laos, did not participate in this large study. The multicentre study by the European Community Respiratory Health Survey (ECRHS) has already shown important geographical differences in the prevalence of asthma;[3] similar variations in developing countries strongly suggest an environmental influence.[4] The ISAAC study confirmed these great disparities in prevalence around the world, with a much lower prevalence in developing countries than in countries with a high standard of living. The prevalence in rural areas remains generally unknown,[5] especially in highland areas.

Dalat is a large rural town of 183,000 inhabitants in the province of Lam Dong, 400 km northeast of Ho Chi Minh city, and is well known for having been established by Alexandre Yersin in 1893. It is situated in a forested highland, surrounded by conifers, at an altitude of 1,500 m. The population is primarily agricultural, with special regard to vegetables and flowers. Some embroidery workshops are also found. No atmospheric polluting industries have been identified. The mean annual temperature is 18°C, with a cooler, dry period from

January through April. The rainy season, with storms, begins in May and lasts to the end of October. The mean annual humidity is 88%, and sunshine is maximal in winter. The town is composed of 12 districts and three suburban communities. The standard of living is still low and one distant district with a large population of ethnic minorities has had difficulties in accessing healthcare. We are presenting here the first epidemiological study of a large highland rural population sample in Vietnam, seeking to define the prevalence of asthma or asthma-like symptoms in Dalat, and to provide further information on asthma diagnosis and treatment in this community.

METHODS

The study was performed during 2004. All persons in randomly (by lottery) selected houses of 12 districts were questioned. The initial phase consisted of developing the questionnaire by a Franco-Vietnamese expert group and targeting the population in the 12 districts. The questionnaire was derived from a Vietnamese translation of the ECRHS questionnaire and validated by a bilingual pulmonologist (Appendices 1–3). The next step was dedicated to the expert group training the investigators in the use of the questionnaire. 12 groups of ten investigators each were then formed, with physicians and medical students, plus a physician familiar with the region in charge of each group.

The population was advised of the investigation, via local television daily for one week and by each health district. The streets of the town were divided into even and odd sides and then were selected by lottery for the study. Every individual in each household was questioned, and when physician-diagnosed asthma or new cases of asthma and asthma-like symptoms were found, they completed all parts of the questionnaire. The first part of the questionnaire comprised questions to track down asthma-like symptoms, to differentiate from chronic obstructive pulmonary disease (COPD) and to determine smoking status, and contact with animals or dust (Appendix 1). The second part of the questionnaire included clinical characteristics, past medical history, and any family history of asthma (Appendix 2). In this study, the classification of asthma severity was based on clinical features recommended by Global Initiative For Asthma (GINA).[6] All of those with asthmatic and asthma-like symptoms completed the last part of the questionnaire on allergic manifestations for nose, eyes and skin (Appendix 3).

For physician-diagnosed asthmatic patients, i.e. those who had been diagnosed and treated before this survey, the investigators filled in three parts of the questionnaire (Appendices 1–3) and recommended the patients to complete the study with spirometry (Spirolab II, Italy) and prick tests (Stallergenes, France) during their next visit to a hospital or health centre. Those with "asthma-like symptoms" must have had at least one positive response to three questions about their breathlessness (Appendix 1). They then completed all the questions asked by the investigators and received their own appointment for a consultation at a hospital or health centre to reconfirm the diagnosis and to complete the study with spirometry and prick test. The responses were checked and validated

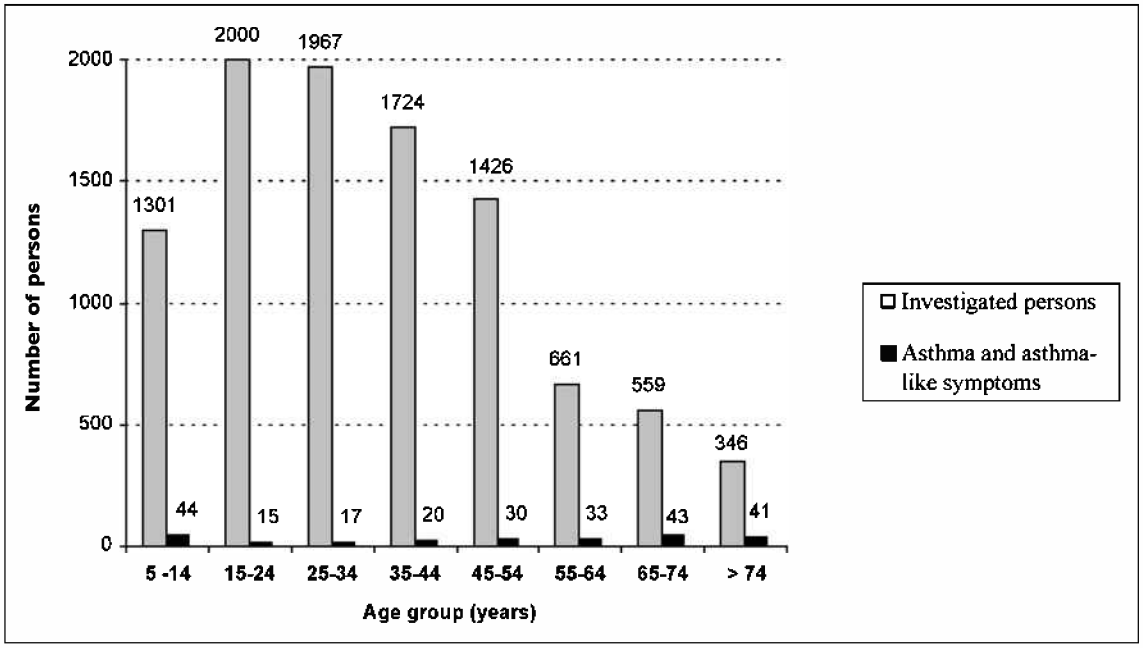

Fig. 1 Distribution of the questioned population by age group and corresponding number of asthma and asthma-like symptoms.

Table I. Demographical characteristics of patients.

Variables	No. (percentage)
Prevalence of asthma and asthma-like symptoms	
By age	
5–14 years (n = 1,301)	44 (3.4)
≥ 15 years (n = 8,683)	199 (2.3*)
By gender	
Male (n = 4,789)	121 (2.5)
Female (n = 5,195)	122 (2.3)
General population (n = 9,984)	243 (2.4)
Smoking status (age ≥ 15 years) (n = 199)	
Current smokers	65 (32.6)
Ex-smokers	15 (7.7)
Non-smokers	119 (59.7)
Familial history (n = 243)	
Asthma	64 (26.3)
Allergic rhinitis	20 (8.2)
Eczema	14 (5.8)
Asthma and rhinitis	2 (0.1)
Don't know	143 (59.6)
Associated chronic illnesses (age ≥ 15years) (n = 199)	
Arterial hypertension	24 (12.1)
Arthritic disease	28 (14.1)
Cardiac disease	11 (5.5)
Diabetes mellitus	2 (1.0)
Miscellaneous	8 (9.0)
Asthma severity classification	
Physician-diagnosed asthma (n = 164)	
Stage I	95 (57.9)
Stage II	22 (13.4)
Stage III	10 (6.1)
Stage IV	37 (22.6)
New cases of asthma and asthma-like symptoms (n = 79)	
Stage I	61 (77.2)
Stage II	16 (20.3)
Stage III	2 (2.5)
Stage IV	0 (0)

*different significance vs 5–14 years ($p < 0.05$)

by the study staff before clinical consultation. If the responses were aberrant, the patients were re-contacted by a physician for clarification.

In the second phase of the study, those with asthmatic and asthma-like symptoms were seen in a hospital setting for a more detailed analysis of their illness, including severity, frequency of past hospitalisations, treatment received, any known triggers for the asthma attacks, and clinical examination. Investigation for trigger factors included detailed questioning for symptoms of heartburn and acid regurgitation, in consideration of possible gastroesophageal reflux disease (GERD).[7] The persons whose asthma questionnaire responses led to a suspicion of undiagnosed COPD (Appendix 1) were excluded from the study, when the suspicion was confirmed on clinical examination, spirometry (FEV1/FVC < 70%), and bronchodilator irreversibility testing (increase in FEV1 < 12% or PEF < 15% after 30 minutes of 400 μg aerosolised β2-agonist).[8]

Some 900 persons between 15 and 65 years of age were randomly selected to fill out another questionnaire dealing with general knowledge about asthma for future community education programmes (Appendix 4). The last phase, currently in progress, is a group education effort in Dalat and in the district dispensary when the number is sufficient to justify this. The educational material is relayed by local television and printed asthma documents. The Epi Info software, version 6.0, was used to analyse data collection. All data were expressed as mean values ± standard deviation. χ^2 test was used to compare the percentage (prevalence) and values of $p < 0.05$ indicated statistical significance.

RESULTS

The study included 9,984 persons equally distributed among the 12 districts (4,789 men, 5,195 women). The questionnaire was completed for 164 persons in equal numbers of men and women who had been diagnosed and treated by physicians before this study (physician-diagnosed asthma). A further 79 patients with asthma and asthma-like symptoms (39 men, 40 women) were diagnosed, based on a positive response to any of the following three questions:

1. "Have you heard wheezing in your chest at any time in the last 12 months?"
2. "Have you felt as if you were suffocating while reclining during the day at any time in the last 12 months?"
3. "Have you been awakened by an attack of breathlessness at any time in the last 12 months?"

59 previously-undiagnosed COPD sufferers were excluded from the study by the assessement described under Methods. The total number of cases of asthma and asthma-like symptoms was therefore 243. The number of patients in each age group is shown in Fig. 1. The demographical characteristics of the 243 cases of asthma and asthma-like symptom disease are listed in Table I. The smoking status, familial history of asthma and allergy, and chronic illnesses associated with asthma are also presented. The 65 current smokers were nearly all men (96.4%) and the average tobacco consumption was 25 ± 21 pack-years. For the smokers, 91.5% used manufactured cigarettes, 7.7% used roll-your-own cigarettes, and 0.8% used a water-pipe. Of these 243 patients, there were 156 patients

Table II. Principal triggers and prevalence of asthma crisis by season.

Asthmatics and patients with asthma-like symptoms	Percentage (%)
Trigger factors (n = 243)	
Physical exercise	23.0
Smoke (tobacco or firewood)	18.4
Exposure to dust	15.8
Acute respiratory infection	15.7
Anxiety or stress	8.5
Change of climate	6.6
Use of pesticides in the workplace	5.3
Contact with animal	4.6
Suspected GERD	1.3
Side-effects of medication	0.8
Prevalence of asthma crisis by season (n = 49)*	
Cool season (January–April)	20.0
Wet season (May–September)	31.0
Cold season (October–December)	49.0

GERD: gastroesophageal reflux disease
*for patients classified in stages III and IV of asthma severity

in stage I asthma (64.2%), 38 in stage II (15.6%), 12 in stage III (5.0%), and 37 in stage IV (15.2%). The average age of patients was 48 ± 27 (range 5–95) years and the age at onset of asthma was 25 ± 22 (range 3–52) years. During 2003, among 164 physician-diagnosed asthmatics, 30 patients had been hospitalised for asthma (18.3%) on 45 occasions, or 1.5 ± 0.5 hospital events per patient.

The principal trigger factors of asthma crises were physical exercise, smoke from tobacco or firewood, exposure to dust, and acute respiratory infection. Other trigger factors were related to asthma in the following descending order: anxiety or stress, change of climate, use of pesticides in the workplace, contact with animals, suspected GERD, and side effects of medication (Table II). For the 49 patients in stages III and IV, crises occurred more frequently in the cold season (October–December, with the peak incidence in October) than during the April–September wet season. Crises occurred less frequently in the cool season (February–April). Of the 69 physician-diagnosed asthma patients with stages II, III and IV disease (Table I), only 17.1% were taking medication on a daily basis, 24.4% took medication occasionally, and 58.5% were treated only during a crisis. The medication was divided between sprays (34.1%); tablets (56.5%) [of which 43.1% were corticosteroids, 23.2% theophyllines, and 33.7% albuterol]; nebulisation of albuterol (6.2%); and injection of corticosteroids (3.2%). Associated atopic manifestations were found in 127 persons (52.3%).

Allergic characteristics and the results of allergy prick tests for these atopic patients are presented in Table III. The most frequently positive tests were with *Dermatophagoïdes pteronyssinus*, *Dermatophagoïdes farinae* and *Blomia tropicalis*. Others allergens such as cockroach (*Blatella germanica*), cat, dog, date palm tree (*Phoenix dactylisera*) and *Alternaria* spp. were reactive in a small percentage. In this population, there were many cases of polyvalent positive responses to prick tests for house dust mites. There were 27% positive tests for *Dermatophagoïdes pteronyssinus* alone, but 50% patients were positive for *Dermatophagoïdes pteronyssinus* associated with *Dermatophagoïdes farinae* and *Blomia tropicalis*; 19% positive for *Dermatophagoïdes pteronyssinus* and *Dermatophagoïdes farinae*, 4% for *Dermatophagoïdes pteronyssinus* and *Blomia tropicalis*. The evaluation of asthma knowledge through 21 questions among 900 random persons aged from 15 to 65 years revealed that the majority of the population lacked general knowledge about asthma. An incorrect response was found in 11.1% of the questions, 60.9% responded "don't know" about asthma information, and only 28.0% had the correct response (Appendix 4).

DISCUSSION

The prevalence of asthma is poorly defined in developing countries. In many corners of the globe, asthma frequently goes undiagnosed and access to basic medications is limited or non-existent. In Vietnam, endemic tuberculosis has been the major focus among respiratory disorders and other conditions have been emphasised only in recent years. There have been few studies using a standardised questionnaire to determine the prevalence of asthma symptoms in the general population in Vietnam. An unpublished 1996 preliminary study of asthma in a limited sample of the Ho Chi Minh City's population established a prevalence of 3.6%. In a recent study in the urban capital city of Vietnam (Ha Noi, located in the north) of asthma and atopic symptoms among school children aged 5–11 years old by using the ISAAC questionnaire (969 responses), the authors found that 12.1% of children had experienced asthma, 13.9% had doctor-diagnosed asthma, and 14.9% had wheezing in the past 12 months.[9] Our study in Dalat showed a much lower prevalence of asthma and asthma-like symptoms: only 3.4% in children aged 5–14 years and 2.3% in the population aged ≥ 15 years ($p < 0.05$). There was no statistical difference in the prevalence between male and female patients (Table I).

In the study of prevalence of asthma and asthma-like symptoms among adults in rural Beijing (Shunyi, Tongxian city in China), Chan-Yeung et al found that the mean prevalence of wheeze was 2.7% and that of reported asthma attacks in the past 12 months was 2%.[5] This prevalence is low and near to our present study. The low prevalence of asthma and asthma-like symptoms in the rural highlands of Dalat may be due to the low level

Table III. Atopic manifestations and prick tests for asthma and asthma-like symptoms.

n = 127	Percentage (%)
Atopic manifestations	
Nose	
Runny nose	35.8
Blocked nose	33.3
Sneezing	30.9
Eyes	
Itchy eyes	57.6
Tearing	42.4
Skin	
Urticaria	73.4
Eczema	20.5
Swelling of the skin	6.1
Allergic prick tests	
Dermatophagoïdes pteronyssinus	43.3
Dermatophagoïdes farinae	30.0
Blomia tropicalis	23.3
Cockroach *(Blatella germanica)*	10.0
Cat	10.0
Dog	5.1
Date palm tree *(Phoenix dactylisera)*	4.4
Alternaria spp.	1.7
Mix of 3 pollens *(Dactylus glomerata, Phleum pratense, Lolium perenne)*	0.0

of atmospheric pollution, fewer respiratory infections in children, or the lifestyle of the community (larger family size, less maternal smoking, more dampness, contact with animals).[10] The low prevalence of asthma and asthma-like symptoms in Dalat probably did not relate to methodology because the participation rate of the population to the survey was very high (> 95%) and was facilitated by wide publicity on the local television channel, as well as through the town and suburban health centres, and by use of written questionnaires to avoid a problematical video questionnaire. In addition, all households included in the study were randomly selected.

The prevalence of asthma and asthma-like symptoms of 2.4% in Dalat is not inconsistent with what would be expected in a rural zone of a developing country, although urban Asian population centres have a prevalence much higher than this; the ISAAC study found a higher prevalence in Hong Kong (10.1%), Fukuoka, Japan (13.4%), and Bangkok (13.5%). There were also marked variations in the prevalence of asthma symptoms reported by written questionnaire and symptoms were particularly high in English-speaking countries and Latin America. The major prevalence differences between populations found by the ISAAC study were likely to be due to environmental factors.[2] Our study shows the number of patients who were current smokers. Most of these were classified in stages I and II. This data may suggest that these patients lacked general knowledge about the hazards of tobacco smoke on their asthma. Tobacco usage is almost exclusively limited to men but remains important as in all developing countries, where publicity on the hazards of smoking is limited, in contrast to aggressive advertising by the manufacturers.

Among asthma trigger factors, our study shows that 18.4% were exposed to smoke (Table II). Smoke arises from farmers burning their fields after harvest as well as from home heating and cooking. In Dalat, coal and wood are the major household fuels used for heating and cooking. The relatively cold, dry winter period of October to December (mean temperature 17°C) appears to favour asthmatic attacks possibly related to indoor pollution. Xu and Wang found that using coal for cooking resulted in a substantially higher particulate concentration than using gas for cooking.[11] Hospitalisations were rather frequent (18.3%) in the year prior to our study, which may have resulted from insufficient treatment early in the illness. Limited availability and usage of medication, inadequate infrastructure to provide medication, and especially cost are important factors limiting the early use of medication. Another factor could be cultural behaviour with regard to methods of drug administration, in particular regarding inhaled medication. Our study confirmed the preference for oral forms of medication, especially corticosteroids. This is one of the reasons for providing each asthmatic subject with an albuterol inhaler, in order to introduce this form of medication as part of the general asthma education programme. It should be emphasised that oral corticosteroids and theophyllines are inexpensive in Vietnam, while all inhaled medications are much more expensive and not always available in pharmacies and hospitals. Steroid inhaler delivery systems are among the most expensive products.

Clinical signs and symptoms of allergy occurred in slightly over half of the subjects with asthma. Despite the high altitude, house dust mite allergies are prevalent. Positive polyvalent cutaneous reactions are frequent. Positive prick tests to at least one of the mite antigens tested *(Dermatophagoïdes pteronyssinus, Dermatophagoïdes farinae, Blomia tropicalis)* were found in 50% of those felt to have house dust allergies. Studies in Singapore on the prevalence and distribution of indoor allergens also indicated a predominance of mite allergies.[12] In one study, *Blomia tropicalis* was the predominant allergen determined by prick tests (96.2%) in patients with asthma or allergic rhinitis.[13] A study in Thailand of 100 asthmatic infants also revealed cutaneous reactions, predominantly to house dust mites *(Dermatophagoïdes pteronyssinus* 67%, *Dermatophagoïdes farinae* 62%).[14] *Blomia*

tropicalis was not tested. Similar findings were found in three Southeast Asian sites.[15]

We were surprised to find no pollen allergies, which reflects a different background flora than that found in temperate climates. This should justify more detailed pollen allergy testing. In Malaysia, different pollen allergies were observed in urban areas,[16] but none of the 200 asthma sufferers were found to be allergic to pollen alone. In this study, none of the asthmatics held plant-derived aeroallergens to be responsible for precipitating their asthmatic attacks. Nevertheless, 30% of the asthmatic subjects reacted positively in skin prick tests to different pollens from grasses or trees (Acacia), and comparable results were found in the Thai study.[14] All the data suggest that pollens are not the major allergenic factors in the tropical zone where climatic variations are attenuated. The *Phoenix dactylitera* that we have tested is a date palm that does not grow in Vietnam, but there may be cross-antigens with other palms from tropical countries. Budgetary considerations did not permit us to couple prick tests with total or specific serum IgE determinations.

The questionnaire responses regarding the subjects' understanding of asthma (Appendix 4) were interesting and revealed a global misunderstanding of the illness, therapeutic options, and even basic anatomy. In light of these responses, it seemed to us indispensable to embark on an immediate educational programme for active asthma patients. Local television accorded us several time slots after our results were known. Pulmonary function testing will also be done at many health centres. More intensive allergic investigation is planned for those suffering from rhinitis. In conclusion, this ground-breaking study in Vietnam shows low prevalence of asthma and asthma-like symptoms in a highland tropical zone. It also demonstrates suboptimal diagnosis and treatment and the predominance of allergic cutaneous reactions to house dust mites. A need for financial assistance to put epidemiological studies in place in developing countries and to improve ongoing medical care for asthmatic patients seems evident.

ACKNOWLEDGEMENTS

This study was financed by the Committee Against Respiratory Disorders of the French Department of Val de Marne in collaboration with the Franco-Vietnamese Pulmonary Association (AFVP) which developed the study protocols. A CD-ROM on aerosol therapy produced by the French Language Society of Pulmonology was translated into the Vietnamese language.

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Appendix 1. Asthma questionnaire.

1. Respiration

Among the following descriptions, which single response best describes your respiration:		
1.1.	I never or rarely have any problems breathing.	
1.2.	I have frequent breathing problems but the problem resolves itself completely.	
1.3.	My breathing is never normal.	

2. Breathlessness

Questions		Yes	No
2.1	Have you had an attack of difficult breathing at rest during the day at any time in the past 12 months?		
2.2	Have you had an attack of difficult breathing after intense exercise at any time in the past 12 months?		
2.3	Have you been awakened by an attack of difficult breathing after intense exercise at any time in the past 12 months?		

3. Wheezing and difficulty breathing

Questions		Yes	No
3.1	Have you ever had wheezing in your chest at any time in your life?		
3.2	Have you ever had wheezing in your chest at any time in the last 12 months?		
3.3	If yes, how many times have you had crises of wheezing in the past 12 months? 1 to 3 4 to 12 over 12		
3.4	Has a crisis of wheezeing awakened you from sleep in the past 12 months?		
3.5	Have you awakened in the morning with a sensation of difficulty breathing in the past 12 months?		
3.6	In the past 12 months, have you heard wheezes in your chest during or after exercise?		
3.7	In the past 12 months, have you had difficulty breathing while walking quickly on a flat surface or on climbing a gentle slope at a normal pace?		

4. Asthma

Questions		Yes	No
4.1	Have you ever had an asthma attack at any time in your life?		
4.2	Have you had an asthma attack at any time in the past 12 months?		
4.3	Have you taken medication for asthma in the past 12 months? In a pill By inhalation In a syrup By injection Others		
4.4	Do you take asthma medication from time to time?		
4.5	Do you take asthma medication EVERY DAY?		

5. Cough and expectoration (for COPD)

Questions		Yes	No
5.1	In the past 12 months, have you been awakened by a dry cough during the night, when you did NOT have a cold or respiratory infection?		
5.2	Do you usually cough when you get up in the morning?		
5.3	Do you cough nearly every morning during three or more months of the year?		
5.4	For how many years have you had this cough? State number of years.		
5.5	Do you usually cough up sputum (phlegm, mucus) as soon as you get up in the morning?		
5.6	Do you cough up this sputum on most mornings during at least two months per year?		
5.7	For how many years have you been coughing up this sputum? State number of years.		

6. Tobacco usage

Questions		Yes	No
6.1	Have you smoked for at least a year?		
6.2	If yes, do you smoke regularly? Cigarettes Water Pipes Cigars		
6.2	On the average, how many cigarettes do you smoke daily? State number of cigarettes per day.		
6.3	At what age did you begin smoking? State number of years.		
6.4	Have you stopped smoking in the last month?		
6.5	At what age did you stop smoking? State number of years.		

7. Animals, dust

Questions		Yes	No
7.1	Are you bothered by dust during housecleaning activities?		
7.2	Are you bothered by animals at home?		

Appendix 2. Questionnaire regarding clinical characteristics of asthma.

1. Have you seen a doctor for asthma during the past 12 months?
   Yes ☐ No ☐

2. At what age did you first have asthma? _____ years

3. Have you had wheezing or breathing crises during the past 12 months?
   Yes ☐ No ☐

4. In the past 12 months, which of the following have you had during the day? (check only 1 response)
   - An attack < 1 per week ☐
   - An attack > 1 per week ☐
   - An attack < 1 per day ☐
   - An attack every day ☐
   - Persistent symptoms ☐
   - Continuous limitation of activities ☐

5. In the past 12 months, which of the following have you had during the night? (check only 1 response)
   - An attack < 2 per week ☐
   - An attack > 2 per week ☐
   - An attack > 1 per week ☐
   - Frequent attacks ☐

6. Do you know your trigger factors?
   - Dust ☐
   - Contact with animals ☐
   - Smoke (tobacco, firewood) ☐
   - Respiratory Infections ☐
   - Workplace chemicals (e.g. pesticides) ☐
   - Changes in the weather (e.g. storms, cool season, wet season) ☐
   - Physical exercise ☐
   - Anxiety or stress ☐
   - Drugs: aspirin or others* ☐
   - *Which drug?: _____
   - Acid reflux (GERD) ☐

7. On the average, how many hospitalisations have you had in the past 3 years? _____ times/year

8. In which months did your attacks occur?

January	☐	April	☐	July	☐	October	☐
February	☐	May	☐	August	☐	November	☐
March	☐	June	☐	September	☐	December	☐

9. Do you take medication for asthma? In what form?
   Occasionally ☐ Every day ☐ At the time of an attack ☐

Medication	Beta-2 mimetic	Corticosteroides	Theophylline	Others
Inhaler spray				
Tablet				
By nebuliser				
Others				

Appendix 3. Questionnaire on allergy for asthma and asthma-like symptoms.

A. Eyes and nose

1. Have you had problems of the eyes or the nose? Yes ☐ (Eyes ☐ Nose ☐) No ☐

2. At what age did these problems begin? _____ years

3. Check the symptom that bothers you the most:

Itchy eyes	☐
Tearing	☐
Sneezing	☐
Runny nose	☐
Blocked nose	☐
Loss of sense of smell	☐
Other	☐

4. Do you know the trigger factors for your problems with the eyes and nose ?

Dust	☐
Contact with animals	☐
Smoke (tobacco, firewood)	☐
Workplace chemicals (e.g. pesticides)	☐
Changes in the weather (e.g. storms, cool season, wet season)	☐

5. In which months did your problems with the eyes and nose occur ?

January	☐	April	☐	July	☐	October	☐
February	☐	May	☐	August	☐	November	☐
March	☐	June	☐	September	☐	December	☐

6. In the past 12 months, have you consulted a doctor for your eyes and nose problems? Yes ☐ No ☐

7. In the past 12 months, have you taken medication for your eye and nose problems? Yes ☐ No ☐
   If yes, which one(s) _____

8. In the past 12 months, have you taken preventative measures for these problems? Yes ☐ No ☐

B. Skin

1. Have you any skin problems? Yes ☐ No ☐

2. At what age did your skin problems begin? _____ years

3. Which skin problem bothered you the most this year?

3.1. Urticaria (skin which itches a great deal as in poison ivy; urticaria disappears usually within a few hours) ☐

3.2. A swelling of the skin (without associated itching or rash, most often around the eyes or lips, associated sometimes with breathing difficulty) ☐

3.3. Some eczema at the inside of the elbows, the knees, or on the face ☐

3.4. Another symptom? If yes, which? _____

4. In the past 12 months, have you consulted a doctor for your skin problems? Yes ☐ No ☐

5. In the past 12 months, have you taken medication for your skin problems? Yes ☐ No ☐
   If yes, which? _____

6. In the past 12 months, have you taken preventative measures for these skin problems? Yes ☐ No ☐
   If yes, which? _____

C. General information

Do your parents, siblings, or children suffer from an allergic disease? Yes ☐ No ☐

If yes, Asthma ☐ Rhinitis ☐ Eczéma ☐

Appendix 4. Results of questionnaire on asthma knowledge from the general population (n = 900).

No.	Questions	Correct response (%)	Incorrect response (%)	Don't know (%)
1.	It is necessary for an asthmatic sufferer to always carry an immediate-acting bronchodilator spray.	60.0	1.1	38.9
2.	There are preventative treatments for exercise-induced asthma.	53.3	12.2	34.5
3.	When an asthma attack occurs, it is necessary to take a spray of Ventolin.	23.3	2.3	74.4
4	Asthma may provoke a sensation of tightness of the chest.	32.2	3.4	64.4
5.	Asthma is an illness of the bronchial tubes.	21.1	7.8	71.1
6.	The bronchial airways resemble tubes.	20.1	4.5	74.4
7.	Asthma is an illness that may last a lifetime.	47.7	9.0	43.3
8.	At the time of an asthma attack, the airways are dilated.	13.3	16.7	70.0
9.	Air circulates inside the bronchial tubes.	25.5	3.3	71.2
10.	During asthma, there is narrowing of the bronchial tubes.	23.3	1.2	75.5
11.	Wheezing in the chest is a sign of asthma.	20.0	6.7	73.3
12.	Cough is not a symptom of asthma.	30.1	28.8	41.1
13.	Exercise may be the cause of an asthma attack.	34.4	12.2	53.4
14.	A bronchodilator dilates the bronchial tubes.	20.0	8.9	71.1
15.	Allergies may provoke asthma.	16.6	16.6	81.8
16.	Asthma is not an anxiety-provoking illness.	36.6	28.8	24.6
17.	Asthmatics are able to play sports.	18.8	26.6	54.6
18.	Respiratory infections may cause an asthma attack.	16.6	7.7	75.7
19.	Inhaler treatment is the best treatment.	20.0	7.7	72.3
20.	Oral treatment is always associated with undesirable side effects.	10.0	7.8	82.2
21.	Asthma has a familial relationship.	45.5	20.0	34.5
	Average score ± standard deviation	28.0 ± 13.7	11.1 ± 8.7	60.9 ± 17.8